

Eros Up Close and Personal

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The NEAR Shoemaker spacecraft entered orbit around minor planet (433) Eros in February 2000 and spent the next year studying the asteroid from a variety of orbital geometries. On February 12, 2001, NEAR Shoemaker landed safely on Eros' surface, and it continued operating for 16 days.

Half a dozen engineers in JPL's Navigation and Flight Mechanics Section were responsible for designing the orbital and landing trajectories, determining the actual spacecraft trajectory, and designing the maneuvers that made it happen. The navigation team used optical observations of small craters on Eros' surface to supplement the usual radio metric tracking data (Doppler and range) in the orbit determination process. Navigation results included an excellent estimate for the mass and spin state of Eros as well as an indication from the gravity field that Eros' density is close to uniform.

Results like these cannot be obtained without a lot of hard work and at least a little bit of luck. Personal anecdotes give some context to the navigation achievements.